http://optics.eee.nottingham.ac.uk

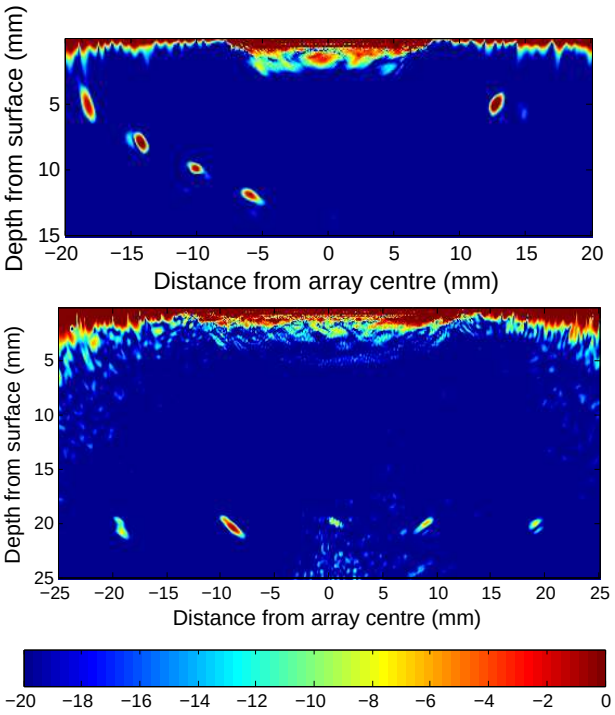
The University of Nottingham
UNITED KINGDOM · CHINA · MALAYSIA

Optics and Photonics Group
Lunchtime Seminar

"Laser induced phased arrays"

Theodosia Stratoudaki

Department of Mechanical Engineering, University of Bristol
Department of Electrical and Electronic Engineering, Faculty of Engineering, University of Nottingham



Abstract

12:00pm Thursday 16th March 2017
203 Tower Building
All Welcome

http://optics.nottingham.ac.uk/wiki/Talks_2017

“Laser induced phased arrays”

Theodosia Stratoudaki

12:00pm Thursday 16th March 2017

203 Tower Building

All Welcome

Ultrasonic phased arrays have changed the way that ultrasonic imaging is perceived and are responsible for increased imaging quality in real time. During the last two decades, they have also seen a dramatic increase in their use for nondestructive testing (NDT), which is the focus of the work that will be presented. Conventional piezoelectric transducers are used for the vast majority of phased array ultrasonic measurements. This type of transducers have certain drawbacks: it is a contact technique, requiring some kind of couplant such as adhesive bonding, or immersion in a water tank may be needed. Laser ultrasonics can address this challenge: it is a remote and couplant free technique that can be used in hostile environments, places with limited access and inspection of geometrically complex components. Conventional, transducer based, ultrasonic arrays, have rows of transducers which all fire with an appropriate time delay between them so that the generated ultrasound is focused and steered appropriately inside the examined structure and then they detect the echoes, forming the image. Laser induced phased arrays should be able to focus and steer the ultrasonic beam in a similar manner. Given that a typical ultrasonic array has 60 - 100 individual transducers (array elements), an equivalent laser based ultrasonic array would need as many laser beams to generate the signal and the same number of interferometric detectors. Although some researchers have followed this approach, it is very demanding in terms of hardware. An alternative approach is to perform the imaging in post processing. In this presentation, we will show acoustic imaging using Laser Induced Phased Arrays (LIPAs), in post processing, at the nondestructive, thermoelastic regime, by using a data acquisition method known as Full Matrix Capture (FMC) and an imaging algorithm known as the Total Focusing Method (TFM). The results show significantly improved spatial resolution and defect detectability, using a single laser for ultrasonic generation and a commercially available vibrometer for ultrasonic detection, in a simple configuration.